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PATENT ABSTRACTS OF JAPAN

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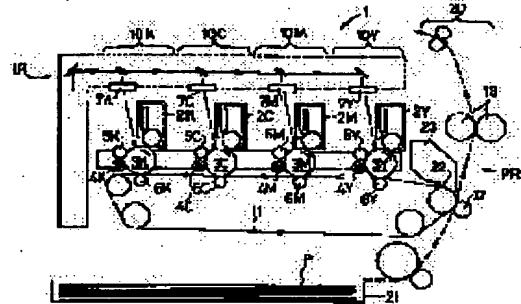
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(54) COLOR IMAGE FORMING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a color image forming device which can keep high image quality, attain a high printing speed, and be compacted, besides, which is excellent in environmental resistance.

SOLUTION: As to a tandem type copying machine 1, holding rollers 5(5Y, 5M, 5C, and 5K) temporarily holding residual toner remaining on photoreceptor drums 3(3Y, 3M, 3C, and 3K) after primary transfer are provided, the residual toner is discharged from the rollers 5 with a prescribed timing, and recovered inside a cleaner box 23 provided on an intermediate transfer belt 11. Thus, since respective image forming units 10(10Y, 10M, 10C, and 10K) can be constituted without cleaners while such image quality deterioration as roughness on a memory image and a dot image, and the color mixture of toner are prevented; the printing speed can be increased and the device can be compacted while keeping the high image quality. Besides, since contact electrifying brushes 4(4Y, 4M, 4C, and 4K), transfer rollers 6(6Y, 6M, 6C, and 6K), and 12 are used, environmental pollution caused by the zone production can be prevented.



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CLAIMS

[Claim(s)]

[Claim 1] In color picture formation equipment characterized by providing the following at least one of said the image formation units It is a cleaner loess image formation unit equipped with a development means of a jumping development method. It is color picture formation equipment which has a toner maintenance means to hold temporarily a residual toner which remained on said image support after imprinting to said middle imprint object, and is characterized by said toner maintenance means discharging a residual toner currently held to predetermined timing. Image support Electrostatic latent-image means forming which forms an electrostatic latent image on said image support Two or more image formation units which have a development means to give a toner to said electrostatic latent image and to form a toner image, and were installed continuously An imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object

[Claim 2] It is color-picture formation equipment which said toner fulfills the conditions of $0.96 \leq (\text{shape factor}) \leq 1.0$ in the color-picture formation equipment characterized by to provide the following, and is characterized by for said image-formation unit to have a toner maintenance means hold temporarily the residual toner which is a cleaner loess image-formation unit equipped with a development means of a contact development method, and remained on said image support after imprinting to said middle imprint object. Image support Electrostatic latent-image means forming which forms an electrostatic latent image on said image support Two or more image formation units which have a development means to give a toner to said electrostatic latent image and to form a toner image, and were installed continuously An imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object

[Claim 3] Color picture formation equipment characterized by performing image formation process control so that image formation processing may not be performed, when a residual toner discharged from said toner maintenance means exists in an exposure location and a development location on said image support in color picture formation equipment indicated to claim 1.

[Claim 4] Color picture formation equipment characterized by having a recovery means to collect from claim 1 residual toners discharged from said toner maintenance means in any one color picture formation equipment indicated by claim 3.

[Claim 5] It is color picture formation equipment characterized by being either of the cleaning means which said recovery means contacted said middle imprint object or said middle imprint object in color picture formation equipment indicated to claim 4, and were established.

[Claim 6] It is color picture formation equipment characterized by for said recovery means being a cleaning means contacted and formed in said middle imprint object in color picture formation equipment indicated to claim 4, and said cleaning means having a rotation cleaning means and a fixed cleaning means.

[Claim 7] Color picture formation equipment characterized by having an electric charge means to

re-electrify a residual toner discharged by the upstream of said cleaning means from said toner maintenance means in the polarity of normal in color picture formation equipment indicated to claim 5 or claim 6.

[Claim 8] Said electric charge means is color picture formation equipment characterized by being formed with the quality of the material which is in a positive side to a residual toner discharged [in / on color picture formation equipment indicated to claim 7, and / an electrification sequence] from said toner maintenance means.

[Claim 9] It is color picture formation equipment characterized by forming said electric charge means by conductive member in color picture formation equipment indicated to claim 7, and impressing the same polar voltage as the electrification polarity of normal.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the color picture formation equipment used for a copying machine, a printer, etc. of an electrophotography method. Furthermore, it is related with the color picture formation equipment which was excellent in them at pair environment nature while improvement in the speed and miniaturization of printing speed were attained by them, maintaining high definition in details by considering an image formation unit as a cleaner loess configuration.

[0002]

[Description of the Prior Art] As an example of conventional color picture formation equipment, there is a thing as shown in drawing 9. This image equipment 100 is the thing of the tandem type which carried out the parallel arrangement of yellow, a Magenta, cyanogen, and the four image formation units 101Y, 101M, 101C, and 101K for blacks continuously. Image formation unit 101Y for yellow centers on photo conductor drum 102Y. Electrification charger 103Y which electrifies the surface of photo conductor drum 102Y uniformly around it, Development counter 104Y which develops the electrostatic latent image formed on photo conductor drum 102Y, and is used as a toner image, It has cleaning box 106Y which collects and holds the residual toner which remained on photo conductor drum 102Y after imprint charger 105Y for imprinting a toner image on a record object, and the imprint of a toner image. Moreover, a Magenta, cyanogen, and the image formation units 101M, 101C, and 101K for blacks are also the things of the same configuration as this.

[0003] And the electrostatic latent image of a yellow component color is formed on photo conductor drum 102Y of image formation unit 101Y, and after this electrostatic latent image is developed by development counter 104Y and used as a toner image, that toner image is imprinted by the record object by imprint charger 105Y. Subsequently, the electrostatic latent image of a Magenta component color is formed on photo conductor drum 102M of image formation unit 101M, and after this electrostatic latent image is developed by development counter 104M and used as a toner image, that toner image is imprinted by the record object in laminating by imprint charger 105M. After repeating the same process in the image formation units 101C and 101K successively below, a toner is fixed to a record object and it is [a necessary color picture is copied and] made to be recorded by the fixing roller 107.

[0004] Moreover, there are some in which the miniaturization of drawing is by simplifying the cleaning box of some image formation units, and considering as a cleaner loess configuration like the color picture formation equipment indicated by JP,5-53414,A.

[0005]

[Problem(s) to be Solved by the Invention] However, there was a problem that miniaturization of equipment was difficult, with the above-mentioned conventional color picture formation equipment 100. It has the cleaning boxes 106Y, 106M, 106C, and 106K in every image formation unit 101Y, 101M, and 101C of each color, and 101K, and is because the occupancy capacity of each image formation units 101Y, 101M, 101C, and 101K is large.

[0006] On the other hand, in color picture formation equipment 200 given in JP,5-53414,A,

although miniaturization of equipment is attained, it cannot be said that it is enough. It is because it still has the cleaner box to some image formation units. Moreover, non-contact electrification chargers (corona discharge machine etc.) were needed for the image formation unit of cleaner loess, and there was also a problem about the environmental pollution by generating of ozone in it.

[0007] Then, it is made in order that this invention may solve the above-mentioned trouble, and improvement in the speed and miniaturization of printing speed can be attained, maintaining high definition, and let it be a technical problem to offer the color picture formation equipment which was further excellent in pair environment nature.

[0008]

[Means for Solving the Problem] According to invention of claim 1, in order to solve the above-mentioned trouble [Image support, Two or more image formation units which have electrostatic latent-image means forming which forms an electrostatic latent image on said image support, and a development means to give a toner to said electrostatic latent image and to form a toner image, and were installed continuously, In color picture formation equipment which has an imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object At least one of said the image formation units is a cleaner loess image formation unit equipped with a development means of a jumping development method. It has a toner maintenance means to hold temporarily a residual toner which remained on said image support after imprinting to said middle imprint object, and said toner maintenance means is characterized by discharging a residual toner currently held to predetermined timing.

[0009] In invention of claim 1, an electrostatic latent image is formed on image support of electrostatic latent-image means forming, and this electrostatic latent image is developed by development means, and let it be a toner image. And the 1st order of this toner image is imprinted by middle imprint object. Subsequently, after a toner image is formed also in other image formation units, the toner image is imprinted in piles on a middle imprint object in laminating. A toner image is formed on a middle imprint object by repeating same process successively below. Then, the secondary toner image formed in a middle imprint object is imprinted by record object with an imprint means, and it is established, and a necessary color picture is copied and recorded. Here, in each image formation unit, a toner which was not imprinted by middle imprint object remains on image support after the primary toner image was imprinted by middle imprint object. This residual toner is recovered by toner maintenance means before next image formation is performed. And a residual toner collected by toner maintenance means is discharged to predetermined timing. As predetermined timing, in order to maintain high definition, it is good to consider as the time of non-image formation. Moreover, when toner empty, image quality deterioration, etc. are detected, you may make it discharge a residual toner from a toner maintenance means by user input.

[0010] Thus, by having collected residual toners which remain on image support after a primary imprint, and having established a toner maintenance means to discharge the residual toner to predetermined timing Since processing with a residual toner suitable also as a configuration of cleaner loess is performed A residual toner after discharge does not exist in an exposure location and a development location on image support at the time of image formation, color mixture of image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. and a toner is prevented, and high definition is maintained. Since each image formation unit furthermore serves as a configuration of cleaner loess and the occupancy capacity becomes small, improvement in the speed and miniaturization of printing speed are attained by installing these continuously. In addition, a jumping development method is the non-contact development method of making a toner flying and developing it, by impressing AC bias which superimposed alternation voltage on direct current voltage.

[0011] Electrostatic latent-image means forming which forms an electrostatic latent image on image support and said image support according to invention of claim 2, Two or more image formation units which have a development means to give a toner to said electrostatic latent

image and to form a toner image, and were installed continuously, In color picture formation equipment which has an imprint means to imprint a toner image with which a toner image formed for said every image formation unit put on a middle imprint object by which a heavy imprint is carried out one by one, and said middle imprint object, and was imprinted on a record object Said toner fulfills conditions of $0.96 \leq (\text{shape factor}) \leq 1.0$. Said image formation unit It is a cleaner loess image formation unit equipped with a development means of a contact development method, and is characterized by having a toner maintenance means to hold temporarily a residual toner which remained on said image support after imprinting to said middle imprint object.

[0012] Invention of claim 2 is also developed by development means by forming an electrostatic latent image on image support of electrostatic latent-image means forming, and let this electrostatic latent image be a toner image. Then, the primary toner image is imprinted by middle imprint object. Subsequently, after a toner image is formed also in other image formation units, the toner image is imprinted in piles by middle imprint object in laminating. A toner image is formed on a middle imprint object by repeating same process successively below. Then, the secondary toner image formed in a middle imprint object is imprinted by record object with an imprint means, and it is established, and a necessary color picture is copied and recorded. Here, in each image formation unit, a toner which was not imprinted by the primary middle imprint object remains on image support after the primary toner image was imprinted by middle imprint object. This residual toner is recovered by toner maintenance means before next image formation is performed. Thus, since processing with a residual toner suitable also as a configuration of cleaner loess is performed by having established a toner maintenance means collected residual toners which remain on image support after a primary imprint, the residual toner after discharge does not exist in an exposure location and a development location on image support at the time of image formation, the color mixture of image-quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. and a toner is prevented, and high definition is maintained. Since each image formation unit furthermore serves as a configuration of cleaner loess and the occupancy capacity becomes small, improvement in the speed and miniaturization of printing speed are attained by installing these continuously.

[0013] Here, since it has a development means of a contact development method in invention of claim 2, if a residual toner is discharged from a toner maintenance means, in order not to pass through a development location, there is a possibility that it may have a bad influence on development and image quality may deteriorate. Therefore, as a toner used for development, what fulfills conditions of $0.96 \leq (\text{shape factor}) \leq 1.0$ (henceforth a "globular form toner") is used. A shape factor expresses a ratio of a boundary length of a projection image to a boundary length of a considerable circle of a projection image of a toner, and the sphericity becomes low as a perfect spherical next door and a shape factor become small from "1", when a shape factor is "1." And about 100% of imprint effectiveness is securable by using a globular form toner. Thereby, since a toner which remains on image support after a primary imprint serves as a slight amount, if it is till development means exchange, it can collect and hold a residual toner with a toner maintenance means. Therefore, an image formation unit can be considered as a cleaner loess configuration. In addition, a residual toner held at a toner maintenance means is discharged and processed at the time of exchange of a development means.

[0014] According to invention of claim 3, in color picture formation equipment indicated to claim 1, when a residual toner discharged from said toner maintenance means exists in an exposure location and a development location on said image support, it is characterized by performing image formation process control so that image formation processing may not be performed.

[0015] In invention of claim 3, when a residual toner discharged from a toner maintenance means exists in an exposure location and a development location, image formation processing is not performed. Such control is performed by electrostatic latent-image means forming and control means of development bias. According to discharge timing of a residual toner, exposure timing is controlled by electrostatic latent-image means forming, development bias which changes alternation superposition voltage of development bias to direct current voltage etc. by control means of development bias is changed to a float condition, or, specifically, control of making an alternation voltage component small to voltage on which a toner does not fly is performed. Since

a residual toner discharged from a toner maintenance means does not exist in an exposure location on image support by these, image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is prevented. Moreover, since it passes certainly and a residual toner discharged from a toner maintenance means is processed, without a development means collecting development locations on image support, color mixture of a toner is prevented. [0016] Furthermore, in case it shifts to processing at the time of image formation from the time of non-image formation, it is desirable beforehand to control previously, so that discharge and recovery of a residual toner in a toner maintenance means are changed and a residual toner does not come to an exposure location and a development location at the time of image formation by time amount to which a point of arbitration on image support passes through between a toner maintenance means and development locations.

[0017] According to invention of claim 4, it is characterized by having a recovery means to collect from claim 1 residual toners discharged from said toner maintenance means in any one color picture formation equipment indicated by claim 3. Moreover, according to invention of claim 5, in color picture formation equipment indicated to claim 4, said recovery means is characterized by being either of the cleaning means contacted and formed in said middle imprint object or said middle imprint object.

[0018] A residual toner which was discharged from a toner maintenance means and was again supported with invention of claim 4 or claim 5 on image support is recovered by recovery means. It seems that namely, a residual toner does not have a bad influence on image formation, and the inside of equipment is not dispersed. Thereby, high definition is secured. In addition, although a cleaning means contacted and formed in a middle imprint object or said middle imprint object as a recovery means is used, it is also possible to collect with record objects (copy paper etc.) depending on the case.

[0019] According to invention of claim 6, in color picture formation equipment indicated to a claim, said recovery means is a cleaning means contacted and formed in said middle imprint object, and said cleaning means is characterized by having a rotation cleaning means and a fixed cleaning means.

[0020] In invention of claim 6, a residual toner discharged from a toner maintenance means is recovered by a rotation cleaning means and fixed cleaning means. Thereby, since residual toners are collected certainly, high definition is secured. Depending on the case, only one of a rotation cleaning means and the fixed cleaning means may be used. However, since it is difficult for a fixed cleaning means to recover when using a globular form toner, concomitant use with a rotation cleaning means and a fixed cleaning means is desirable, using a rotation cleaning means.

[0021] According to claim 7, in color picture formation equipment indicated to claim 5 or claim 6, it is characterized by having an electric charge means to re-electrify a residual toner discharged by the upstream of said cleaning means from said toner maintenance means in the polarity of normal. Moreover, according to invention of claim 8, in color picture formation equipment indicated to claim 7, said electric charge means is characterized by being formed with the quality of the material which is in a positive side to a residual toner discharged from said toner maintenance means in an electrification sequence. Furthermore, according to invention of claim 9, in color picture formation equipment indicated to claim 7, said electric charge means is characterized by being formed by conductive member and impressing the same polar voltage as the electrification polarity of normal.

[0022] With these color picture formation equipments, a residual toner discharged from a toner maintenance means is electrified by the electrification polarity of normal with an electric charge means. And the residual toner is recovered by cleaning means. Since it is carried out mechanically [recovery by cleaning means at this time], and electrically and a residual toner is certainly recoverable, high definition is secured. In addition, or it uses what was formed with the quality of the material which is in a positive side to a residual toner as an electric charge means in an electrification sequence, impressing the electrification polarity of normal and the same polar voltage to it using a conductive member etc. is mentioned.

[0023]

[Embodiment of the Invention] Hereafter, the gestalt of the operation which materialized the

color picture formation equipment of this invention is explained to details based on a drawing. The gestalt of this operation is the digital color copying machine (only henceforth a "copying machine") which applied the color picture formation equipment of this invention.

[0024] First, the gestalt of operation is explained to the 1st. The copying machine 1 concerning the gestalt of the 1st operation consists of the print sections PR which print the image reader section IR which roughly divides and reads a manuscript image, and the read image in the record paper, and are reproduced, as shown in drawing 1. The image reader section IR reads the optical information acquired by separating the color of a manuscript image into the three primary colors of red (R), green (G), and blue (B) by the CCD sensor, and performs data processing to the image data. Moreover, the conveyance section 20 in which the printer section PR conveys the recording paper P and yellow which is a reappearance color at the recording paper P (Y), A Magenta (M), cyanogen (C), black (K) (a color sign "Y, M, C, K" is hereafter added to the number of the portion relevant to yellow, a Magenta, cyanogen, and each reappearance color of black suitably.) It comes to have four image formation units 10Y, 10M, 10C, and 10K and the middle imprint belt 11 for forming the image of four colors, respectively.

[0025] The conveyance section 20 has the medium tray 21 which holds the recording paper P, the secondary imprint roller 12 which was formed on the middle imprint belt 11 and which piles up and imprints the secondary imprint toner image on the recording paper P, a fixing roller 13, two or more conveyance rollers to which the toner image imprinted by the secondary recording paper P is fixed, etc., sends out the recording paper P to predetermined timing, and conveys it with constant speed.

[0026] The image formation units 10Y, 10M, 10C, and 10K form an image, and the photo conductor drums 3Y, 3M, 3C, and 3K by which the parallel arrangement was carried out continuously consist of electrostatography methods as a center, and around the photo conductor drums 3Y, 3M, 3C, and 3K The electrification brushes 4Y, 4M, 4C, and 4K which electrify uniformly the surface of the photo conductor drums 3Y, 3M, 3C, and 3K, The photo conductor drums 3Y, 3M, and 3C and the laser arm heads 7Y, 7M, 7C, and 7K which form a necessary electrostatic latent image according to image information on 3K, The maintenance rollers 5Y, 5M, and 5C and 5K grade which hold temporarily the development counters 2Y, 2M, 2C, and 2K which a toner is made to fly to an electrostatic latent image, and are developed, and the toner which remained after development to the photo conductor drums 3Y, 3M, 3C, and 3K are arranged. That is, a copying machine 1 is the thing of the tandem type which carried out the parallel arrangement of the four cleaner loess image formation units continuously, and improvement in the speed of a print speed and miniaturization of equipment are attained.

[0027] Moreover, directly under each photo conductor drums 3Y, 3M, 3C, and 3K, the primary imprint rollers 6Y, 6M, 6C, and 6K which imprint the photo conductor drums 3Y, 3M, and 3C and the primary toner image which it developed on 3K are arranged to the middle imprint belt 11. The middle imprint belt 11 is a belt of the shape of endless [which has the surface resistivity of 106-108ohms / ** degree]. Furthermore, between the secondary imprint roller 13 and primary imprint roller 6Y, the cleaner box 23 equipped with the cleaning blade 22 which carries out removal recovery of the toner which remained on the middle imprint belt 11 after the residual toner discharged from the maintenance roller 5 and the secondary imprint is arranged.

[0028] Then, actuation of the copying machine 1 constituted as mentioned above is explained. First, in the control section of a copying machine 1, image data processing, such as a shading compensation, and concentration conversion, edge enhancement, is performed based on the level of the red (R) and green (G) which were obtained in the image reader section IR, and the optical information on the image for every blue (B) color component on the strength. And it changes into the write-in image data of yellow (Y), a Magenta (M), cyanogen (C), and each reappearance color of black (K), and the image data of these yellow (Y), a Magenta (M), cyanogen (C), and black (K) is once stored in said control section.

[0029] Then, based on the image data stored in said control section, modulation luminescence of the laser beam corresponding to each reappearance color is carried out in the laser arm heads 7Y, 7M, 7C, and 7K. On the other hand, after the photo conductor drums 3Y, 3M, 3C, and 3K are rotating in the direction of an arrow head in drawing 1 and are uniformly charged in the surface

with the electrification brushes 4Y, 4M, 4C, and 4K, the exposure scan of them is carried out by said laser beam. The electrostatic latent image corresponding to each photo conductor drums 3Y, 3M, and 3C and each reappearance color formed on 3K is developed by this exposure, respectively with the development counters 2Y, 2M, 2C, and 2K having the toner of each reappearance color, and is used as the toner image of each color. And in each opposite section of the photo conductor drums 3Y, 3M, 3C, and 3K and the middle imprint belt 11, the heavy imprint of these toner images is carried out one by one on the middle imprint belt 11 with the primary imprint rollers 6Y, 6M, 6C, and 6K. Then, the toner image piled up and imprinted on the middle imprint belt 11 is conveyed to the opposite section with the secondary imprint roller 12. And the secondary toner image on the middle imprint belt 11 is imprinted with the secondary imprint roller 12 by the recording paper P to which paper was fed from the medium tray 21. Then, the recording paper P with which the toner image was imprinted is conveyed by the fixing roller 13, and it is fixed to it on the recording paper P while being heated here, and the toner image of each color fusing and being made a full color image.

[0030] On the other hand, the residual toner which remained to the photo conductor drums 3Y, 3M, 3C, and 3K after primary imprinting to the middle imprint belt 11 on the maintenance rollers 5Y, 5M, 5C, and 5K. Moreover, the toners which remained on the middle imprint belt 11 after secondary imprinting to the residual toner and the recording paper P which were discharged from the maintenance rollers 5Y, 5M, 5C, and 5K are collected in the cleaner box 23.

[0031] Here, processing of the residual toner of photo conductor drum lifting in the image formation unit formed into cleaner loess is explained more to details using drawing 2. In addition, since each image formation units of all are the same configurations, they omit and explain a color sign.

[0032] First, -1200V are impressed to the electrification brush 4, and the surface of the photo conductor drum 3 is electrified in abbreviation -700V. Under the present circumstances, since the residual toner which remained on the photo conductor drum 3 after the primary imprint is also electrified by coincidence at negative polarity, all residual toners are collected by the maintenance roller 5 by impressing about [-300V] voltage to the maintenance roller 5. For this reason, in the exposure location on the photo conductor drum 3, since a toner does not exist at all, image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is not generated. Thus, as for the formed electrostatic latent image, development is performed by the development counter 2. To namely, developing-roller 2a by which the development gap was set more widely than a toner layer as 200 micrometers. The development bias which superimposed amplitude 1500V and an alternating current component with a frequency of 2kHz on direct-current-voltage-300V is impressed. The toner layer formed in developing-roller 2a by this flies in a development field, and is given to an electrostatic latent image, the electrostatic latent image formed on the photo conductor drum 3 is developed, and a toner image is formed.

[0033] The amount of toners with which the development on the photo conductor drum 3 at this time is presented is 0.9 mg/cm². Concentration sufficient with a degree is securable. Moreover, high imprint effectiveness can be acquired by impressing suitable imprint voltage to the middle imprint belt 11. Therefore, with the gestalt of this operation, -500V were impressed to the primary imprint roller 6 as imprint voltage. Thus, the 1st order is imprinted to the middle imprint belt 11 because there is no effect of the recording paper P and high imprint effectiveness can be held, since a toner image is not imprinted on the direct recording paper P. And by securing high imprint effectiveness, the amount of the residual toner which remains on the photo conductor drum 3 after a primary imprint can be lessened. Even if this does not prepare the cleaner box which collects residual toners for every image formation unit, it becomes possible to collect residual toners only with the maintenance roller 5.

[0034] The case where a whole surface solid image is imprinted is considered using the printing length of the **** direction as 40cm in A3 size here. In addition, the imprint effectiveness in the gestalt of this operation is 90%. The amount of the toner with which the amount of the toner with which development is presented as described above is actually used for development since 0.9 mg/cm² and imprint effectiveness are 90% serves as 32.4 mg/cm. Therefore, the amount of the residual toner which remains on the photo conductor drum 3 serves as 3.6 mg/cm. And the

amount of toners which the maintenance roller 5 should collect since the outer diameter of the maintenance roller 5 is set to phi16mm with the gestalt of this operation is 0.72 mg/cm². It becomes, and since the layer of a residual toner is below two-layer, it can be enough supported with the maintenance roller 5.

[0035] And although it is necessary to discharge and process the residual toner collected on the maintenance roller 5 at the time of non-image formation, in case a toner image is piled up by the imprint with the primary imprint roller 6, in order that the collected residual toner may contact the toner image of other color components, color mixture of it is carried out also to some. For this reason, it cannot return to a development counter like the cleaner loess image formation equipment of monochrome. Then, before the residual toner discharged from the maintenance roller 5 arrives at a development location, the alternating current component of development bias is turned off and it is supposed that development bias control of changing only to a dc component is performed. Without the residual toners discharged from the maintenance roller 5 being collected by the development counter 2 by this, it will pass through a development location and the color mixture of a toner is prevented.

[0036] The development bias control at this time is explained using the timing chart of drawing 3. Time of day T1 It is in the condition of image formation processing, and the exposure scan by the laser arm head 7 is performed, an electrostatic latent image is formed, with the development counter 2, alternating voltage V1 is impressed as development bias, and development is performed. Moreover, voltage V3 is impressed to the maintenance roller 5, and the residual toners after a primary imprint are collected.

[0037] And time of day T1 It sets, the applied voltage to the maintenance roller 5 is changed to voltage V4, and discharge of a residual toner is started. moreover, time of day T1 from — time amount t1 Time of day T2 after progress It sets and the exposure scan by the laser arm head 7 is completed. Here, time amount t1 is time amount taken for the location of the arbitration on the photo conductor drum 3 to move from an opposite location with the maintenance roller 5 to an exposure location. Namely, time of day T2 It sets, and just before the residual toner discharged on the photo conductor drum 3 from the maintenance roller 5 arrives at an exposure location, the exposure scan by the laser arm head 7 is completed. Thereby, the residual toner discharged from the maintenance roller 5 by the exposure location on the photo conductor drum 3 does not exist at the time of the exposure scan by the laser arm head 7, and image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is prevented at it.

[0038] furthermore, time of day T1 from — time amount t2 Time-of-day T3 after progress It sets and development bias is changed from alternating voltage V1 to direct current voltage V2. Here, it is time amount t2. It is the time amount taken for the location of the arbitration on the photo conductor drum 3 to move from an opposite location with the maintenance roller 5 to a development location. Namely, time-of-day T3 It sets, and just before the residual toner discharged on the photo conductor drum 3 from the maintenance roller 5 arrives at a development location, development bias changes from alternating voltage V1 to direct current voltage V2. Since it passes through a development location certainly, without the residual toners discharged from the maintenance roller 5 being collected by the development counter 2 by this, the color mixture of a toner is prevented.

[0039] Thus, the residual toner discharged from the maintenance roller 5 which passed the development location is charged in negative polarity. Since -500V are impressed to one of these, and the primary imprint roller 6, a residual toner is imprinted by the middle imprint belt 11, is removed by the cleaning blade 22 after that, and is held in the cleaning box 23.

[0040] Then, time-of-day T four It sets, and the voltage impressed to the maintenance roller 5 changes to voltage V3 again, ends discharge of a residual toner, and starts recovery. moreover, time-of-day T four from — time amount t1 Time of day T5 after progress It sets and the exposure scan by the laser arm head 7 is performed. further — time of day T5 from — time amount t2 Time of day T6 after progress It sets, development bias is changed from direct current voltage V2 to alternating voltage V1, and image formation processing is performed again. And repeat activation of the above-mentioned residual toner processing is carried out, and a residual toner is processed appropriately. Since it becomes unnecessary to prepare the cleaning

box for collecting residual toners for every image formation unit by this, cleaner loess-ization can be attained.

[0041] As mentioned above, according to the copying machine 1 applied to the gestalt of this operation as explained to details The maintenance roller 5 which holds temporarily the residual toner which remained on the photo conductor drum 3 after the primary imprint is formed. By discharging the residual toner from the maintenance roller 5 to predetermined timing, and having made it collect in the cleaner box 23 prepared on the middle imprint belt 11 Since each image formation unit 10 can be considered as a cleaner loess configuration and occupancy capacity becomes small, maintaining high definition, miniaturization of equipment is attained. Moreover, since a copying machine 1 is a tandem type, improvement in the speed of printing speed is also attained. Furthermore, since the electrification brush 4 of a contact process and the imprint rollers 6 and 12 are used, there is also no environmental pollution by generating of ozone.

[0042] In addition, it does not pass over the gestalt of this operation to mere instantiation, and it does not limit this invention at all. Therefore, naturally amelioration various by within the limits which does not deviate from the summary, and deformation are possible for this invention. For example, although the thing of a jumping development method is used with the gestalt of implementation of the above 1st as development counters 2Y, 2M, 2C, and 2K, since color mixture is not carried out to other color components about the yellow component of which a primary imprint is performed at the very first to the middle imprint belt 11, considering as a contact development method is also possible. Moreover, the maintenance roller 5 may be arranged to whichever of the upstream and the downstream to the electrification brush 4, and even if it touches the electrification brush 4 further, it may be unified. It is also possible to use a film, a blade, a roller, etc. and to use a fiber brush, a magnetic brush, a film, a blade, etc. instead of the maintenance roller 5 instead of the electrification brush 4 further again. In addition, location sequence, an applied-voltage value, etc. of each image form unit are mere instantiation, and it cannot be overemphasized that it is not restricted to these.

[0043] Next, the gestalt of the 2nd operation is explained. Although the copying machine 1 and fundamental structure concerning the gestalt of the 1st operation are made the same as the copying machine 30 concerning the gestalt of the 2nd operation is shown in drawing 4 , the configurations of a development counter 32 and the cleaning box 33 differ for a while. That is, the cleaning box 33 is equipped with the rotation brush 34 using the thing of the contact development method which holds a nonmagnetic 1 component globular form toner (mean particle diameter of 8 micrometers) as a development counter. In addition, a same sign is attached about the same thing as what was illustrated as a gestalt of the 1st operation, and the explanation is omitted.

[0044] Processing of the residual toner on the photo conductor drum 3 in the image formation unit by which such a copying machine 30 was formed into cleaner loess is explained to details using drawing 5 . In addition, since each image formation units of all are the same configurations, they are explained, using image formation unit 3Y of yellow (Y) as a representative.

[0045] First, -1200V are impressed to electrification brush 4Y, and the surface of photo conductor drum 3Y is electrified in abbreviation-700V. Under the present circumstances, since the residual toner after a primary imprint is also electrified by coincidence at negative polarity, all residual toners are collected by maintenance roller 5Y by impressing the about [-300V] voltage V3 to maintenance roller 5Y. For this reason, in the exposure location on photo conductor drum 3Y, since a toner does not exist at all, image quality deterioration of ZARATSUKI of a memory image or a halftone dot image etc. is not generated. Thus, as for the formed electrostatic latent image, development is performed by development counter 2Y. That is, the development bias Vb is impressed to development counter 2Y, and the toner layer formed on the development sleeve 35 by this is given in a development field to an electrostatic latent image. The electrostatic latent image formed on photo conductor drum 3Y is developed by this, and a toner image is formed.

[0046] The amount of toners with which the development on photo conductor drum 3Y at this time is presented is 0.9 mg/cm². Concentration sufficient with a degree is securable. Moreover, high imprint effectiveness can be acquired by impressing suitable imprint voltage to the middle

imprint belt 11. Therefore, with the gestalt of this operation, -500V were impressed to primary imprint roller 6Y as imprint voltage. And by securing high imprint effectiveness, it becomes possible to lessen the amount of the residual toner which remains on photo conductor drum 3Y after a primary imprint.

[0047] However, since the development sleeve 35 touches photo conductor drum 3Y in development counter 32Y, the residual toners discharged from maintenance roller 5Y will be collected by development counter 3Y. For this reason, although the problem of color mixture is not produced in the image formation unit of the yellow which performs a primary imprint at the very first at the middle imprint belt 11, in the Magenta (M) arranged at the degree of yellow (Y), cyanogen (C), and each image formation unit of black (K), color mixture with other colors poses a problem.

[0048] Then, he makes imprint effectiveness into about 100%, and is trying for a toner to hardly remain on photo conductor drum 3Y after a primary imprint by using a globular form toner in the gestalt of this operation. For this reason, it becomes possible to collect residual toners in maintenance roller 5Y, and to hold to the life cycle of development counter 3Y. And the residual toner collected by maintenance roller 5Y is discharged from the maintenance roller 5 at the time of exchange of development counter 2Y, and are collected in the cleaning box 33 equipped with the rotation brush 34 through the middle imprint belt 11. It is because the globular form toner is used, so it is difficult to remove the residual toner on the middle imprint belt 11 with a blade. Moreover, in order to raise removal effectiveness, the dc component is impressing the voltage which superimposed amplitude 100V and the frequency of 2kHz as an alternating current component at the voltage which is -500V to a rotation brush. Thereby, the residual toner on the middle imprint belt 11 is removed certainly, and is held in the cleaning box 33.

[0049] As described above, since conglomeration of a toner was required, with the gestalt of this operation, it investigated about the image quality deterioration by the toner configuration. The result is shown in a table 1.

[0050]

[A table 1]

形状計数 S F	画像品質
0. 9 4	×
0. 9 5	×~△
0. 9 6	○
0. 9 8 5	○
0. 9 9 5	○

[0051] Image quality deterioration becomes remarkable as a shape factor SF becomes small so that clearly from a table 1. And with [a shape factor SF] "0.96", high definition can be secured, without image quality deterioration arising. [more than] Therefore, a shape factor SF is the toner which fulfills the conditions of "0.96 <=SF<=1.0", and the more desirable one with it of the ability to be used as a globular form toner is good. [near / a shape factor SF is infinite and / "1.0"]

[0052] As mentioned above, according to the copying machine 30 applied to the gestalt of the 2nd operation as explained to details, about 100% of imprint effectiveness is acquired by having held the globular form toner in the development counter 2 of a contact development method. Thereby, it becomes possible [the residual toner which remains on the photo conductor drum 3 after a primary imprint] for the maintenance roller 5 to recover this residual toner, and to hold to the life cycle of a development counter 3, since it becomes a minute amount, and the color mixture of a toner is also prevented. Therefore, since each image formation unit can be considered as a cleaner loess configuration and the occupancy capacity becomes small,

maintaining high definition, miniaturization of equipment is attained. Moreover, since a copying machine 1 is a tandem type, improvement in the speed of printing speed is also attained. Furthermore, since the electrification brush 4 of a contact process and the imprint rollers 6 and 12 are used, there is also no environmental pollution by generating of ozone.

[0053] In addition, it does not pass over the gestalt of this operation to mere instantiation, and it does not limit this invention at all. Therefore, naturally amelioration various by within the limits which does not deviate from the summary, and deformation are possible for this invention. For example, with the gestalt of implementation of the above 2nd, the arrangement location of the electrification brush 4 and the maintenance roller 5 may be made into reverse. It is because there are few possibilities that the electrification polarity of the residual toner on photo conductor drum 3Y will turn into reversed polarity since the middle imprint belt 11 is minded and primary imprint voltage can be stopped low, so there is almost no possibility that the recovery capacity of the maintenance roller 5 may decline. Moreover, although the maintenance roller 5 is used as a maintenance means of a residual toner, it is possible by impressing alternating voltage to the electrification brush 4, without forming the maintenance roller 5 to also make electrification of the photo conductor drum 3 and recovery of a residual toner make it serve a double purpose. In addition, location sequence, an applied-voltage value, etc. of each image form unit are mere instantiation, and it cannot be overemphasized that it is not restricted to these.

[0054] The gestalt of the 3rd operation is explained to the last. The copying machine concerning the gestalt of the 3rd operation makes the same the copying machine 1 and fundamental structure concerning the gestalt of the 2nd operation, and only the configurations of a cleaning box differ. That is, as shown in drawing 6, the cleaning box 43 is equipped with the cleaning rotation brush 44 and a cleaning blade 42.

[0055] In each opposite section of the photo conductor drum 3 and the middle imprint belt 11, the heavy imprint of the toner image formed on the photo conductor drum 3 with this copying machine as well as the gestalt of the 2nd operation is carried out one by one on the middle imprint belt 11 with the primary imprint roller 6. Then, the toner image piled up and imprinted on the middle imprint belt 11 is conveyed to the opposite section with the secondary imprint roller 12. And the secondary toner image on the middle imprint belt 11 is imprinted with the secondary imprint roller 12 by the recording paper P to which paper was fed from the medium tray 21. Then, the recording paper P with which the toner image was imprinted is conveyed by the fixing roller 13, and it is fixed to it on the recording paper P while being heated here, and the toner image of each color fusing and being made a full color image.

[0056] the residual toner which remained on the photo conductor drum 3 on the other hand after primary imprinting to the middle imprint belt 11 — the maintenance roller 5 — moreover, the toners which remained on the middle imprint belt 11 after secondary imprinting to the residual toner and the recording paper P which were discharged from the maintenance roller 5 are collected in the cleaner box 43.

[0057] Here, if the imprint effectiveness at the time of imprinting the secondary toner image piled up and imprinted on the middle imprint belt 11 on the recording paper P becomes remarkably low, it will become the cause which causes image quality deterioration only with a rotation cleaning means or a fixed cleaning means chisel, without the ability fully cleaning. For example, when resistance change of the secondary imprint roller 12 and the middle imprint belt 11 is large, and a record object is very coarse, secondary imprint effectiveness falls. So, in the copying machine concerning the gestalt of this operation, the cleaning box 43 equipped with the cleaning rotation brush 44 and a cleaning blade 42 is formed.

[0058] And the most is first removed mechanically by the cleaning blade 42, and the toners which remained on the middle imprint belt 11 are collected. Moreover, paper powder, a foreign matter, etc. are removed by the cleaning blade 42. Under the present circumstances, the toner which was not able to be removed by the cleaning blade 42 is removed mechanically and electrically by the cleaning rotation brush 44 with which the voltage which superimposed amplitude 100V and the frequency of 2kHz on the voltage whose dc component is -500V as an alternating current component is impressed, and are collected. Thereby, the toner which remained on the middle imprint belt 11 is removed certainly, and are collected in cleaning

BOKKU 43. Therefore, even when secondary imprint effectiveness falls and many toners remain on the middle imprint belt 11, the toner is removed certainly and image quality deterioration is prevented.

[0059] As mentioned above, according to the copying machine applied to the gestalt of the 3rd operation as explained to details, the toner which remained on the middle imprint belt 11 after the secondary imprint is removed certainly, and are collected. Thereby, image quality deterioration is prevented and high definition is maintained. Moreover, since the parallel arrangement (tandem type) of each image formation unit is carried out with the cleaner loess configuration, miniaturization and improvement in the speed of printing speed are attained. Furthermore, since the electrification brush 4 of a contact process and the imprint rollers 6 and 12 are used, there is also no environmental pollution by generating of ozone.

[0060] In addition, it does not pass over the gestalt of this operation to mere instantiation, and it does not limit this invention at all. Therefore, naturally amelioration various by within the limits which does not deviate from the summary, and deformation are possible for this invention. For example, since the toner which remained to the middle imprint belt 11 has the electrification property of amphipathy, it is impressing the voltage which superimposed the alternating current component to the cleaning rotation brush 44 with the gestalt of this operation, but even if it does not superimpose an alternating current component, the same removal effect can be acquired by considering as the configuration shown below.

[0061] That is, the 1st configuration provides the nylon sheet 52 which electrifies the electrification polarity of the toner which remained on the middle imprint belt 11 after the secondary imprint to the upstream of the cleaning rotation brush 44 in the polarity (it becomes negative polarity in the gestalt of this operation) of normal, as shown in drawing 7. Moreover, direct-current-voltage +500V are impressed to the cleaning rotation brush 44. Therefore, since the toner which remained on the middle imprint belt 11 after the secondary imprint is electrified by the negative polarity which is the electrification polarity of normal altogether in case it passes the nylon sheet 52, they are certainly collected by the cleaning rotation brush 44. In addition, it is [that what is necessary is just what what is arranged to the upstream of the cleaning rotation brush 44 is not restricted / what / to a nylon sheet, but electrifies a toner in the polarity of normal like silicone rubber] possible not only a sheet but to constitute from a roller, a blade, etc.

[0062] Moreover, the 2nd configuration provides the conductive liner sheet 62 in the upstream of the cleaning rotation brush 44, as shown in drawing 8. And direct-current-voltage-1000V are impressed to a conductive liner sheet 62, and direct-current-voltage +500V are impressed to the cleaning rotation brush 44. Therefore, since the toner which remained on the middle imprint belt 11 after the secondary imprint is electrified by the negative polarity which is the electrification polarity of normal altogether in case it passes a conductive liner sheet 62, they are certainly collected by the cleaning rotation brush 44. In addition, what is arranged to the upstream of the cleaning rotation brush 44 is not restricted to a sheet configuration, but is good also as a roller, a blade, etc.

[0063] Although the gestalt of operation of this invention was explained above Although the copying machine illustrated as a gestalt of the above-mentioned implementation is put on a middle imprint belt, and imprints the toner image formed in each photo conductor drum and the recording paper is made to imprint the toner image on a middle imprint belt further It cannot be overemphasized that this invention is applicable to the copying machine which puts the toner image formed in each photo conductor drum on a direct record object one by one, and imprints it.

[0064]

[Effect of the Invention] As mentioned above, according to the color-picture formation equipment of this invention, each image-formation unit was able to consider as a cleaner loess configuration by establishing a toner maintenance means hold temporarily the residual toner which remained on image support after the imprint, discharging the residual toner from a toner maintenance means to predetermined timing, and having made it collect in the recovery means established on the middle imprint object, maintaining high definition as explained. And the color

picture formation equipment which improvement in the speed and miniaturization of printing speed were attained, maintaining high definition, and was excellent in pair environment nature is offered by having carried out the parallel arrangement of each of these image formation units continuously, and having used the electrification means of a contact process, and the imprint means.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing having shown the whole copying machine configuration concerning the gestalt of the 1st operation.

[Drawing 2] It is drawing having shown the configuration of an image formation unit.

[Drawing 3] It is timing-chart drawing of image formation processing control.

[Drawing 4] It is drawing having shown the whole copying machine configuration concerning the gestalt of the 2nd operation.

[Drawing 5] It is drawing having shown the configuration of an image formation unit and a cleaner box.

[Drawing 6] It is drawing having shown the configuration of the cleaner box in the copying machine concerning the gestalt of the 3rd operation.

[Drawing 7] It is drawing having shown the 1st modification of the cleaner box in the copying machine concerning the gestalt of the 3rd operation.

[Drawing 8] It is drawing having shown the 2nd modification of the cleaner box in the copying machine concerning the gestalt of the 3rd operation.

[Drawing 9] It is the outline block diagram of conventional color picture formation equipment.

[Description of Notations]

1 30 Copying machine

2 32 Development counter

3 Photo Conductor Drum

4 Electrification Brush

5 Maintenance Roller

6 Primary Imprint Roller

7 Laser Arm Head

10 Image Formation Unit

11 Middle Imprint Belt

12 Secondary Imprint Belt

13 Fixing Roller

20 Conveyance Section

21 Medium Tray

22 Cleaning Blade

23, 33, 43 Cleaner box

[Translation done.]

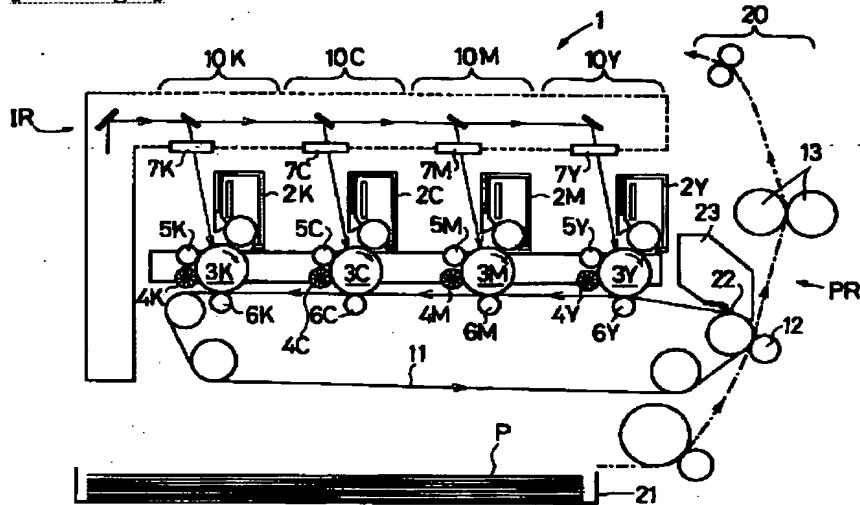
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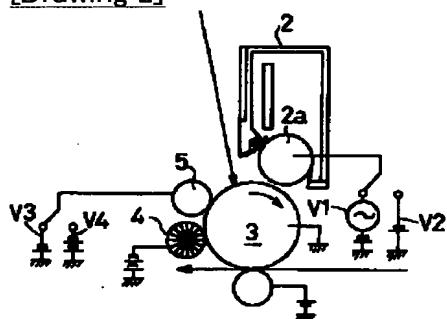
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DRAWINGS

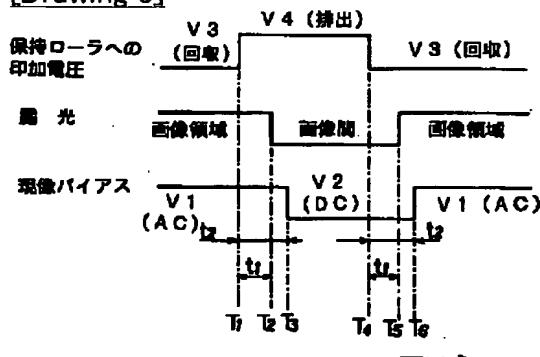
[Drawing 1]



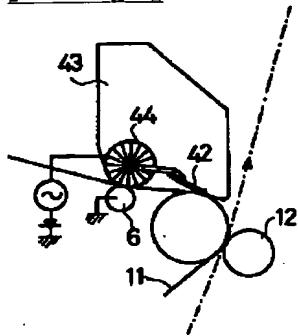
[Drawing 2]



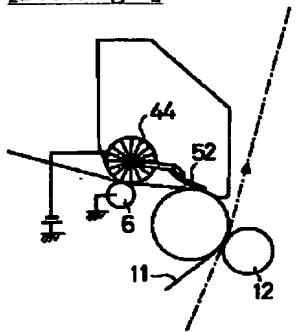
[Drawing 3]



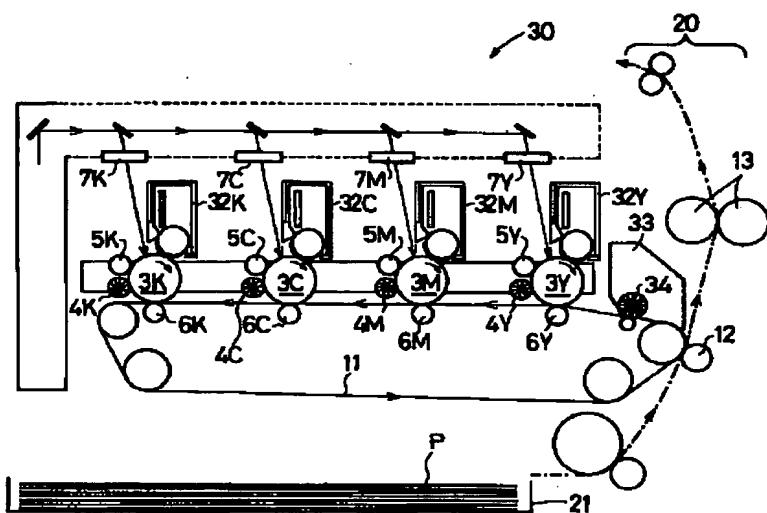
[Drawing 6]



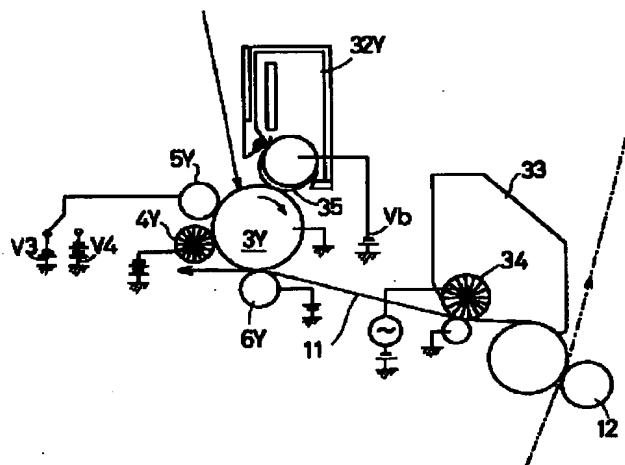
[Drawing 7]



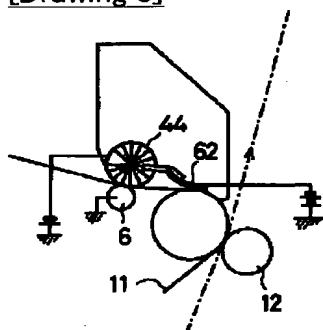
[Drawing 4]



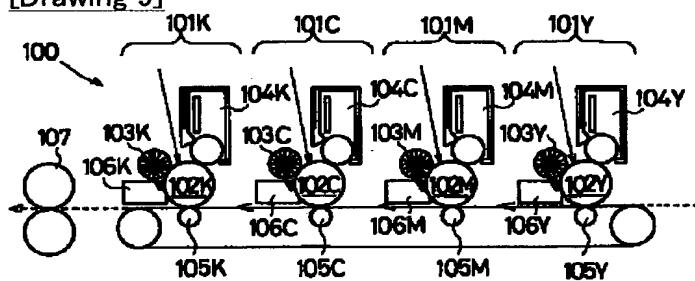
[Drawing 5]



[Drawing 8]



[Drawing 9]



[Translation done.]

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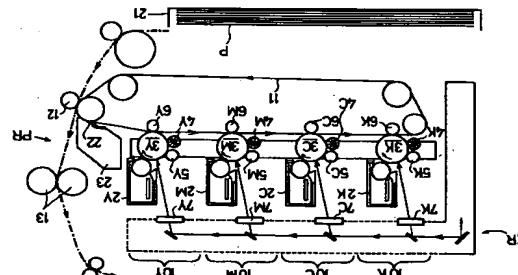
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(21) 出願人	0000000079 ミルタ株式会社 大阪府大阪市中央区安土町二丁目3番13号
(72) 発明者	河崎 明博 大阪国際ビル
(74) 代理人	弁理士 岡戸 隆佳 (外2名)
審査請求 未請求 請求項の数9 OI (全11頁)	(71) 出願人 0000000079 ミルタ株式会社 大阪府大阪市中央区安土町二丁目3番13号



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收されるからが画面質が確保される。場合によつては、回転滑滑手段とのどちらか一方のみを用いてもよい。ただし、荷物トナーを使用する場合には、固定滑滑手段により回収するものが困難ながら、回転滑滑手段を用いるか、回転滑滑手段と固定滑滑手段との併用が望ましい。

【0021】請求項7によれば、請求項5または請求項6に記載するカラー画像形成装置において、前記滑滑手段の上部側に前記トナー保持手段から排出された残留トナーを正規の極性に耳帶電させる荷電手段を有することを特徴とする。また、請求項8の説明によれば、請求項7に記載するカラー画像形成装置において、前記滑滑手段は、帶電系列において前記トナー保持手段から排出された残留トナーに対し正側にある材質で形成されていることを特徴とする。さらに、請求項9の説明によれば、請求項7に記載するカラー画像形成装置において、前記荷電手段は、導電性部材で形成され正側の荷電極性と同じ極性の電圧が印加されることを特徴とする。

【0022】これらのカラーハイブリッドトナーは、トナー保持手段から排出された残留トナーが荷電手段により正規の帶電極性に帶電させられる。そして、その残留トナーは滑滑手段により回収される。このときの滑滑手段による回収は、機械的および電気的に行われるから、確実に残留トナーを回収することができため、画面質が確保されている。なお、荷電手段としては、荷電系列において残留トナーに対し正側にある材質で形成されたものを用いる、あるいは導電性部材を用いて実際に正側の荷電極性と同じ極性の電圧を印加する等が挙げられる。

【0023】【第4の実施の形態】以下、本発明のカラー画像形成装置を具体化した実施の形態について図面に基いて詳細に説明する。本実施の形態は、本発明のカラーハイブリッドトナーを適用したデジタルカラーハイブリッドトナーである。

【0024】まず、第1に実施の形態について説明する。第1の実施の形態にかかる複数機種は、図1に示すように、大きく分けて原稿画像を読み取るイメージリーダ部IRと、複数機種のデータを記録するプリント部PRとから構成されている。イメージリーダ部IRは、原稿画像を赤(R)、緑(G)、青(B)の3原色に色分解して得られた光情報をCCDセンサで読み取り、その画像データに対して演算処理を行う。また、プリント部PRは、記録紙Pを搬送する搬送部20と、記録紙Pに再現色であるイエロー(Y)、マゼンタ(M)、シアン(C)、ブラック(K)の各原色の書き込みデータに変換し、これらのイエロー(Y)、マゼンタ(M)、シアン(C)、ブラック(K)の画像データを前記制御部に一括送信する。

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【0025】搬送部20は、記録紙Pを収容する給紙トレイ21と、中間転写ベルト1上に形成された重ね転写トナー像を記録紙Pに2次転写する2次転写ローラ12と、記録紙Pに2次転写されたトナー像を定着させる定着ローラ13及び複数の輸送ローラ等とを有しており、記録紙Pを所定のタイミングで送り出し一定速度で搬送するようになっている。

【0026】画像形成ユニット10Y、10M、10C、10Kは、静電成像方式で画像を形成するものであり、連続的に並が配置された感光体ドラム3Y、3M、3C、3Kを中心として構成されている。そして、感光体ドラム3Y、3M、3C、3Kの周囲には、感光体ドラム3Y、3M、3C、3Kの表面を一様に帶電させる帶電ブラシ4Y、4M、4C、4Kと、感光体ドラム3Y、3M、3C、3K上に画像情報を応じて所要の静電潜像を形成するカラーハイブリッドトナーを2次転写される。その後、中間転写ベルト1上に重ね転写されたトナー像は、定着ローラ12と、静電潜像に對してトナーを飛附させて現像する現像器2Y、2M、2C、2Kと、現像後に感光体ドラム3Y、3M、3C、3Kに残留したトナーを一時的に保持する保持ローラ5Y、5M、5C、5K等が配置されている。すなはち複数機種1は、4つのクリーナー画像形成ユニットを並列配置したタンデム式のものであり、印刷速度の高速化および装置のコンパクト化が図られている。

【0027】また、各感光体ドラム3Y、3M、3C、3Kの直下には、中間転写ベルト11への1次転写後(以下、1次転写)に感光体ドラム3Y、3M、3C、3Kに残留した感光体ドラム3Y、3M、3C、3Kが印字される。その後、中間転写ベルト11上に重ね転写されたトナー像は、定着ローラ13と、静電潜像に對してトナーを飛附させて現像する現像紙P上に定着される。

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【0028】一方、感光体ドラム3Y、3M、3C、3Kは、図1の矢印方向に回転しており、帯電ブラシ4Y、4M、4C、4Kにより表面を一様に帯電された後、前記レーザー光により高転写率を得ることができる。従つて、本実施の形態では1次転写ローラ6に転写電圧として-5.00Vを印加した。このように中間転写ベルト11に1次転写するのは、直接記録紙Pに転写しないので記録紙Pの影響がなく高転写率を得られるからである。そして萬能電圧を保つことにより、1次転写後の感光体ドラム3上に残留された各再現色に対する静電潜像は、各再現色のトナー像を転写しないので記録紙Pの影響がなく萬能電圧を得ることができる。これにより、1次転写トナーの量を少なめにすることができる。これにより、残留トナーを回収するクリーナーボックスを各画像形成ユニットごとに設けなくて、保持ローラだけで残留トナーを回収することができる。前記したように現像に供されるトナーの量が、0.9m²/cm²、転写電圧が9.0%である。

【0029】ここでA3サイズで通紙方向の印字長さを40cmとして、全面ベータ画像を転写した場合を考え。なお本実施の形態での転写率は9.0%である。前記したように現像に供されるトナーの量が、0.9m²/cm²、転写電圧が9.0%であるから、実際に現像に使用されるトナーの量は3.2.4mg/cm²となる。従つて、感光体ドラム3上に残留する残留トナーの量は3.6mg/cm²となる。そして、本実施の形態では保持ローラ5の外径をΦ1.6mmとしているから、保持ローラ5が回収すべきトナー量は0.72mg/cm²となり、また残留トナーの量は2層以下であることから保持ローラ5に十分拘束できる。

【0030】そして、保持ローラ5に回収した残留トナーを半導体形態に排出し処理する必要があるが、回収した残留トナーは、1次転写ローラ6による転写でトナーを重ね合わせず、他の色成分のトナーと接触するため若干なりとも混色している。このため、モノクロのクリーナーレンズ画像形成装置のように現像器に残すことができるない、そこで、保持ローラ5から排出された残留トナーが現像部11に到達する前に、現像部11の交流成分をオフセットするとしている現像バイアス制御部により、保持ローラ5から排出された残留トナーが、現像器2に回収されることが防止される。

【0031】ここで、クリーナーレンズされた画像形成ユニットにおける感光体ドラム上の残留トナーの処理について、図2を用いてより詳細に説明する。なお、各画像形成ユニットはすべて同じ構成であるから、色符号を省略して説明する。

【0032】まず、帯電ブラシ4に-12.00Vを印加して感光体ドラム3の表面を約-7.00Vに帯電させた後、ローラ5上に形成された静電潜像は、現像器2に同時に負電荷で形成される。このたび、現像器2は、帯電手段5から排出された残留トナーが、現像部11に-3.00Vの程度の電圧を印加することにより劣化は発生しない。このようにして形成された静電潜像は、現像器2により現像が行われる。すなわち、現像ギャップがトナー層より広く2.00μmに設定された現像ローラ2aに、直流電圧-3.00Vに駆動する電圧V3が印波数2kHzの交流成分を重畠する現像バイアスが印加され、これにより現像ローラ2aに形成されたトナー層は現像部2で飛翔して静電潜像に付され、感光体ドラム3上に形成された静電潜像が現像されてトナー像が形成される。

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【0033】このときの現像バイアス制御について説明する。時刻T1以前においては、現像部11の状態にありレーザーヘッド7による電走査が行われ静電潜像が形成されて、現像器2では現像バイアスとして交流電圧V1が印加され現像

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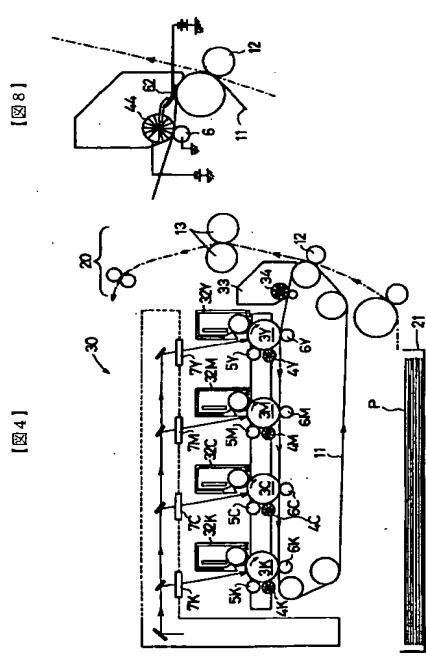
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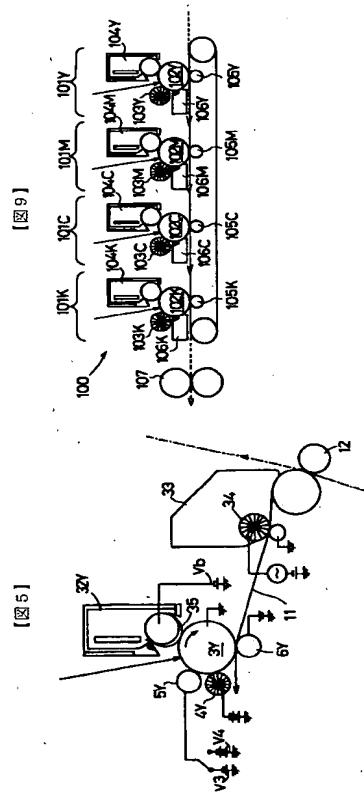
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〔図8〕



[図9]

